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SMUT DISEASES OF WHEAT OATS AND BARLEY

IDENTIFICATION AND CONTROL

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FIGURE 1—Bunt (stinking smut) of wheat. Left: infected heads, with bunt balls replacing wheat grains. Right: normal heads.

INTRODUCTION

OF the seven different cereal smuts illustrated here, five can be controlled by ordinary methods of seed treatment; that is, by disinfecting the surface of the seed with an appropriate chemical, yet they cause enormous losses annually. The first step in disease control whether it be in plants, animals or humans, is diagnosis. With one or two exceptions, any one of the seven smuts can easily be recognized in the field. The following remarks and illustrations will, we hope, be found helpful in problems of identification and control.

SMUT DISEASES OF WHEAT

BUNT (STINKING SMUT)

Botanists recognize two different bunt diseases in Western Canada; but since they differ but little in appearance, and since recommended methods of control are identical, we shall treat them as a single disease. Actually a third form, much more difficult to control, known as dwarf bunt, occurs in the Northwestern United States; but it has not yet been reported in Canada.

Bunt is more likely to be overlooked in the field than any other cereal smut, and farmers are often unaware of its presence until they discover, to their dismay, that their wheat grades 'smutty'. Infected wheat stems are usually somewhat shorter than normal ones. The entire plant may be infected, all wheat grains being replaced by bunt balls; but not infrequently one or more stems of an infected plant may be quite normal, and wheat grains and bunt balls may often be found in the same head. The spores are usually, though not always, characterized by a strong odour resembling decaying fish.

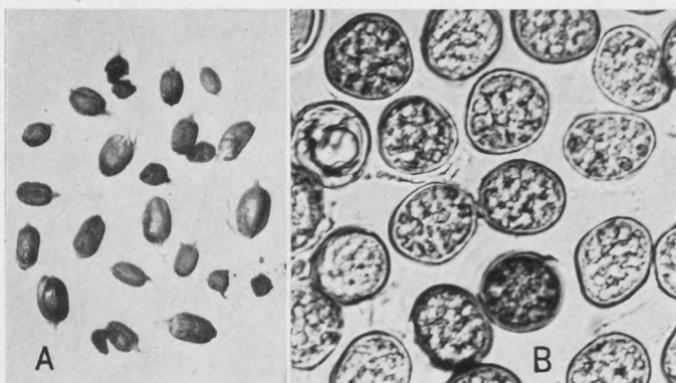


FIGURE 2—A: Bunt balls. Reliable estimates place the number of spores in each ball as high as twelve million. B: spores magnified 660 times. A single spore is capable of causing infection.

Many of the bunt balls are broken during threshing, and the spores adhere to the wheat grains. These spores germinate almost as soon as the wheat is sown, and the fungus penetrates the seedling and continues to grow, as a parasite, in the wheat plant completing the life cycle with the production of another generation of bunt balls in the head.

Treatment of the seed, if done properly, affords complete control. Recommended treatments involve the use of mercurial dusts. Instructions printed on containers should be rigidly observed. Treatment should be completed at least 24 hours before seeding and no harm will result from treating two or three weeks before the seed is to be sown. Formalin should not be used for seed wheat because it almost invariably weakens the germination and, if the seed is shrunken or even slightly cracked or damaged, the loss due to poor stands and increased weed growth may be very serious.

LOOSE SMUT

Loose smut of wheat, though quite common, rarely, if ever, does serious damage. It differs greatly from bunt in appearance and in its life history. Infected heads of wheat and greatly enlarged spores are illustrated in Figure 3. Not only the grains, but nearly all the chaff, also, are replaced by masses of spores. Shortly after the crop has headed out the spores blow away leaving only naked 'rachises' as evidence of the disease. Some of the spores find their way into the flowers of healthy plants where they germinate almost immediately and infect the young developing seeds. However, the seeds develop normally and show no external signs of disease. The following year, the infected seeds produce plants with some or all of the heads like those shown in Figure 3. Unlike bunt which is most easily recognized just before the wheat is ripe, loose smut is most apparent immediately after heading.

Should a farmer find his crop becoming heavily infested, he should, in our opinion, change his seed. The disease can be controlled by the 'hot water' treatment; but few farmers have the necessary equipment and, in any case, only enough for a seed plot should be treated, because some reduction in germinating vigour is to be expected. Detailed instructions concerning hot water treatment may be obtained from Dominion Laboratories of Plant Pathology at Edmonton, Saskatoon, or Winnipeg.

SMUT DISEASES OF OATS

The two smuts of oats, both common in the Prairie Provinces, are illustrated in Figures 4 and 5. Accurate identification in the field is



FIGURE 3—Loose smut of wheat. A: infected and normal heads. B: spores magnified 660 times.



FIGURE 4—Covered smut of oats. A: infected and normal panicles. B: spores magnified 660 times.

often difficult because 'looseness', or the extent to which the glumes and hulls are affected, varies widely.

So far as control is concerned, the two smuts may be considered together, because the treatment is the same. Both may be controlled by the use of mercurial dusts or formalin. In general, mercurial dusts are recommended partly because they afford the seedlings a measure of protection from some other diseases caused by microscopic organisms that live and over-winter in the soil. There is evidence, however, that when infection is very heavy, formalin may give more complete control than will mercurial dusts. Formalin should never be used for treating hulless oats.

SMUT DISEASES OF BARLEY

COVERED SMUT

Covered smut of barley can be identified almost with certainty by means of the accompanying illustration. Hulls and awns are only partly affected, and spores are retained on the head until harvest time. Not infrequently, spore masses, with bits of hull adhering to them, are found in threshed grain. This smut is essentially similar to covered smut of oats. Indeed, some authorities consider that the two fungi belong to one and the same species, though they do not attack the same hosts.

Effective control may be obtained by the use of mercurial dusts. Formalin should be considered as a second choice and should on no account be used for treating hulless varieties.

LOOSE SMUT

Except for the fact that it attacks barley and not wheat, the fungus causing loose smut of barley is practically indistinguishable from that causing loose smut of wheat. Some authorities, at least, consider that the two fungi belong to one species.

Our remarks about the appearance, life history and control of loose smut in wheat are equally applicable to the loose smut disease of barley. In other words, if infection is heavy, the farmer must either change his seed, or employ the hot water treatment. We recommend changing the seed.

FALSE LOOSE SMUT

This disease, also known as black loose smut, resembles loose smut of oats in all essentials. Both fungi may be included in the same species since they differ only in that one attacks oats and the other attacks



FIGURE 5—Loose smut of oats. A: infected and normal panicles. B: spores magnified 660 times.



FIGURE 6—Covered smut of barley. A: infected and normal heads. B: spores magnified 660 times.

barley. Appearance, life history and control methods are practically identical. Mercurial dusts should, therefore, be used for control.

From the farmers' point of view, and this is our chief concern, the two 'loose' smuts of barley present a very difficult problem. They cannot be distinguished in the field and, indeed, the only way to identify them with certainty is to examine germinating spores under the microscope. Yet, one can be controlled by the use of mercurial dusts, or formalin, and the other cannot.

Our advice, therefore, is as follows. If loose smut is observed, collect several 'smutty' heads and place them in envelopes, *one head to each envelope*, and send them to Line Elevators Farm Service, Winnipeg. We undertake to determine to which of the two smuts the specimens belong. Collections must be made soon after the barley has come into head. Farmers suffering loss, and who do not have specimens identified, should treat with a mercurial dust. If the treatment is effective, the disease is false loose smut. If not, assuming treatment to be properly applied, the disease is loose smut.

GENERAL REMARKS

Official recommendations with respect to the necessity for seed treatment are not uniform throughout the Prairie Provinces. In Alberta, for instance, farmers are advised to treat all seed.* Saskatchewan farmers are advised to avail themselves of facilities for having smut tests made and to govern themselves by the results. Manitoba authorities have been conservative in their pronouncements, but are inclined to feel that the heavy losses caused by smuts justify the stand taken in Alberta, even though more often than not, treating wheat seed involves unnecessary trouble and expense.

It is our own belief that all seed of oats and barley should be treated unless the farmer is satisfied that his crops are practically free from smut. If he finds appreciable amounts of smut in oats or barley he should treat, remembering that ordinary methods will not control loose smut of barley. He can make the decision for himself and little or nothing is to be gained by having a smut test made. Nevertheless we will gladly make the test if asked to do so. About the only circumstances that might necessitate a smut test on oats or barley would involve the contamination of clean grain by an infested threshing machine or combine.

Extensive surveys have shown that about three-quarters of oats and barley seed requires treatment. Not so with wheat. So far as

*These remarks refer to wheat, oats and barley, only.



FIGURE 7—Loose smut of barley. A: infected and normal heads.
B: spores magnified 660 times.



FIGURE 8—False loose smut of barley. A: infected and normal heads. B: spores magnified 660 times.

smut is concerned, probably less than one-quarter of the wheat seed needs treatment. Information on the benefits to be expected aside from controlling smut is very inadequate. Therefore, we have no hesitation in inviting farmers to avail themselves of our tests which include consideration of smut, germination and important noxious weeds.

We shall never advise a farmer not to treat his seed; but we are prepared to advise him as to the necessity of doing so insofar as smut is concerned.

Further information on our seed service, and additional copies of this bulletin can be obtained from Line Elevator agents.

ACKNOWLEDGMENTS

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Officers in Charge of the Dominion Laboratories of Plant Pathology at Edmonton, Saskatoon, and Winnipeg have read the manuscript critically and to them we offer grateful thanks. The author, however, assumes full responsibility for statements and recommendations made.

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